Northeastern Forest Experiment Station

Upper Darby, Pa.

QUARTERLY REPORT ON

FOREST INFLUENCES AND FLOOD CONTROL SURVEYS

October 1, 1951

## FLOOD CONTROL SURVEYS

by Norman R. Tripp

For the past three months activity has centered around two main projects--completion of pending survey reports and work on the New England-New York Resources Survey.

### STATUS OF FLOOD CONTROL SURVEY REPORTS

Connecticut River.--In Washington for final approval.

Merrimack River.--Review draft completed.

Salt River.--Tentative draft completed and sent to FIARBC agencies for preliminary review.

Allegheny, Upper Susquehanna, and Monongahela Rivers.--No further progress.

### NE-NYIAC--RESOURCES SURVEY

Work which will contribute to the Resources Survey has been going on steadily along several lines.

Land Use

In collaboration with the SCS, data on basic land acreages, condition and use are being compiled on the basis of SCS Problem Areas. With the Hydrology Section, sample subwatersheds have been chosen to represent typical conditions in each problem area. Complete data on soil-cover complexes, condition and use are being assembled for each subwatershed. These will be used to compare the effect of present and future conditions on runoff and sedimentation.

Hydrology

With information on vegetative cover and soils supplied by the Land Use Section, studies are being carried forward to measure the hydrologic effects of present and future conditions within the subwatersheds. These findings will later be expanded to determine the hydrologic effect of the land treatment program for the entire problem area.

Damage Appraisal

Crews have been in the field for several months gathering data necessary for establishing stage-damage relationships for the New England and New York rivers. Todate the work has been completed in Maine and western New York. The crews will continue working in southern New England as long as weather permits.

In collaboration with the SCS, the P.M.A., and the Corps of Engineers and various state agencies, a list of known local flood damage centers has been compiled. This list contains damage points which vary in size from the major New England cities with enormous damages to small areas where a few houses or a few acres of farm land have been damaged. So far we have 766 points on the list and more coming. Parties composed of both FS-SCS and Corps of Engineers people are now visiting each damage point to decide whether or not some form of a local remedial program is possible and, if so, advising further study by the agency or agencies concerned. Thus we will eventually have a complete file on every known flood damage point in the New England-New York area with specific recommendations for each site.

Cooperation with Department of Agriculture Field Committee

Flood Control people have attended several meetings of the Department of Agriculture Field Committee for the New England-New York area. At these meetings we have explained the work of the flood control organization; have worked on methods of correlating and coordinating flood control surveys with the work of the committee; and have assisted in the formulation of work plans and schedules for the general Resources Survey.

As a part of its work on the NE-NYIAC, the Department of Agriculture, at the request of the Corps of Engineers, has undertaken a study to determine methods and procedures for analyzing the impact of reservoir building on agricultural communities. Earl Rogers took part in the preliminary investigation of two sites in New Hampshire and is now preparing a report to the Department on methods and costs for appraising the effects of inundation on forest lands and industries.

Other Committee Assignments

Don Whelan has been appointed Department of Agriculture representative on the Hydrology Sub-committee of the NE-NYIAC. Among other

things he has been working on a method for estimating flood frequencies which would be acceptable to all agencies represented on the committee. They have been successful and the method has been adopted for NE-NYIAC use.

Norman Tripp has been appointed Department of Agriculture representative to the Flood Control Work and Study Group of the NE-NYIAC. Todate accomplishments have been mainly in the form of attendance at meetings.

Project Work Inventory

As a part of its contribution to the NE-NYIAC study, Region 7 is undertaking a project work inventory for all forest land in the survey area. A Flood Control representative has been appointed to a joint Experiment Station-Region committee which is devising methods and procedures for making the study and which will later supervise conduct of the necessary field work.

DELAWARE BASIN RESEARCH CENTER

by Nedavia Bethlahmy

During the third quarter of the current year we laid the basis for securing additional information on both scrub oak and high forest areas. At the same time, we continued compiling, organizing and analyzing previously obtained data.

General Watershed Analysis

During this quarter we tested the general reliability of the methods used at Dilldown in evaluating the separate items of the water budget. The test was accomplished by computing daily figures for each item for a period of three months of the 1950 summer, and then computing a trial balance for each month on the basis of the equation: Inflow = Outflow ± Storage. The test indicated that the methods are reasonably reliable, but that additional refinements are still in order. Our plans are to determine additional refinements for the following items: riparian water losses and soil moisture losses.

Riparian water loss.--Preliminary analysis by Reigner indicated that riparian water losses may be correlated with saturation deficit and wind movement. The plan is to determine a regression equation that will correlate these losses with the above two factors. Since our wind data are incomplete (week-end measurements are lacking), Reigner devised a satisfactory recording wind gage by installing an electro-magnet in a spare recording rain gage; the magnet is activated by impulses from the anemometer, and in turn activates the pen arm of the rain gage.

Soil water loss.--During the past several months, the resident hydrographer (Dixon Miller) has been taking daily soil moisture readings (with the Colman meter) at all sites in the watershed. These readings are now being compiled and organized in conjunction with all other attending factors. Analysis of this data will result in a regression equation that will correlate soil moisture losses with other factors.

Vegetation Survey

The general plan for the Dilldown Watershed is to convert this scrub oak area to high forest (by planting and intense fire protection) after a period of calibration. Our knowledge of the present vegetative cover is incomplete. Detailed information is needed in order to gage the changes that will occur in the future. Accordingly, Reigner wrote a work plan for a detailed vegetative survey. The plan has been approved. Reigner and O'Brien are now locating the ends of the survey lines.

Stemflow Installations

During the previous quarter, last year's stemflow installations were reactivated at Dilldown. This quarter, new installations were put in the Pocono Forest (a high forest consisting of both conifers and

mixed hardwoods). The stemflow data will supplement the information that is already being collected on interception. The work on stem flow is accomplished on an area rather than single tree basis. In this way, the data derived from each representative area may be applied to the total area occupied in the watershed by the particular type. Two representative areas were selected: northern hardwoods (beech, red maple and cherry of all ages and sizes) and conifer (principally hemlock and rhododendron with associated red maple and birch). Collars were installed on each stem in each of the representative areas.

Soil Reconnaissance

During the quarter, Mr. Walter Lyford, Chief of the Soil Survey Division in the northeast, visited the area. Mr. Lyford gave us the proper soil series nomenclature that is to be used in both the Dilldown and Pocono areas. Descriptions of the soil series in the Dilldown area have not appeared in print. The soils at Dilldown are: Dilldown (named after the Dilldown Watershed), Hazleton and Borie. In the Pocono area the soils are in the Catskill Catena, and consist of the following series (in order of increasingly poor drainage): Catskill, Mardin, Fremont and Volusia.

Collection of soil monoliths.--While at the station, Mr. Lyford showed us an excellent method of collecting soil micro-monoliths. Such a collection is admirable for purposes of demonstration, as well as for correlation with other soils. Briefly, the method consists of sampling and then mounting properly each horizon of the soil. The soil is sampled in a small metal sampler (1" x 1.5" and 1.2" deep) that has within it a closely fitting block of wood whose thickness is slightly less than the depth of the sampler. A small piece of thin cardboard is placed on the wood block, and is covered with glue. The entire assembly is then pressed into the soil horizon being sampled. The blade of a knife is then thrust behind the soil sample, and the sample removed. The soil is then pressed into the sampler, and smoothed over to fit the shape of the sampler. By pushing forward the block of wood, the soil sample is removed from the sampler. The cardboard (onto which the soil is now glued) is mounted on the left hand side of a thick piece of cardboard (3.5" x 10"). The right hand side of the cardboard is reserved for a written description of the soil.

Soil Moisture Units

During the last quarter we found that the roots of scrub oak plants grow deeper than the location of our lowest placed soil moisture unit. Accordingly, we started sampling the deeper soil horizons (down to four feet) for calibration with the Colman moisture units. Because of the extreme rockiness of the soils at Dilldown, it was impossible to use beer cans for sampling. The method followed this time consisted of pressing the units into the soil, and then removing the sample with a volume weight sampler. We recommend this method for all soils that do not lend themselves to easy sampling. Incidentally, the lower depths of

most of our soils were not sampled at all, because not enough rock-free soil was found to enable us to insert the soil moisture units.

Thermistor coefficients.--Before undertaking the new soil calibrations, the factory-designated thermistor coefficients of all units were checked. We found that all the coefficients were incorrect, and that they differed significantly from the coefficients determined in the laboratory. Our opinion is that the factory determined the coefficient of each thermistor before enclosing it in its monel sheath, and that the spot welding in seven places around the sheath changed the value of the coefficient. In general, a change of $\pm$ 0.045 from the true thermistor coefficient reflects a change of $\pm$ 1 on the Colman meter moisture scale; but a similar change on the temperature scale results from a change of only $\pm$ 0.018 from the true thermistor coefficient. Since the scale of the Colman meter cannot be read more accurately than one unit, it is evident that the limits of accuracy of the thermistor coefficients must be within $\pm$ 0.05 for moisture measurements and $\pm$ 0.02 for temperature measurements. Because of the fact that permanent installations of Colman units can yield valuable information on temperature, we recommend that a limit of error of $\pm$ 0.02 be used in checking the accuracy of the thermistor coefficients. Thus, if the factory and laboratory coefficients vary by 0.02 or less, use the factory coefficient; but if the coefficients vary by more than 0.02, use the laboratory coefficients.

## Personnel

During the quarter Donald Close terminated his employment at the Center, and is now employed by the Weather Bureau in Washington.

We now have the help of Jerry O'Brien who works at the Center three days of the week and studies the other two days at Lehigh University.

Harry Price, our statistical clerk, has been on an extended temporary detail in Upper Darby. As a result, the compilation of hydrologic and climatic data for both Dilldown and Pocono has been delayed.

Herb Storey is presently on temporary detail in Washington. From past experience we suspect that this detail will also be extended over a longer period than originally anticipated.

## Miscellaneous

Eric Holmsgaard, a research forester from Denmark, visited the Center. Holmsgaard's research pertains to the correlation of tree ring analyses with climatic data.

Approximately 80 foresters of the Allegheny Section of the SAF visited the Center, and were conducted over the Dilldown Watershed, where they viewed all the projects now in progress.

Storey and Bethlahmy attended the Northeastern Forest Soils

Conference at State College, Pa. The meeting was held in conjunction with the meeting of the Soil Science Society of America.

Recommended reading: Rudolf Geiger, The Climate Near the Ground. (Harvard University Press, 1950).

# MOUNTAIN STATE RESEARCH CENTER

by George R. Trimble, Jr.

## Fernow Experimental Forest

Watersheds.--The first water quality samples from our forested watersheds were taken in July. They showed (in parts per million) a turbidity of 4.0, suspended solids 15-17, dissolved solids 34-36; pH was 7.2. Water temperatures were relatively uniform for all five watersheds ranging from $54\frac{1}{2}^{\circ}$ F. to $55\frac{1}{2}^{\circ}$ F. At the time of sampling heads at the weirs ranged from .082 feet to .152 feet. Discharge was all ground-water flow on a slowly dropping hydrograph.

After a dry July followed by an even drier August, the discharge from our weirs is very low. The flow characteristics of several of the watersheds relative to each other have changed with the great decrease in discharge. The stream from our largest watershed, whose discharge is normally second from the highest, has ceased flowing altogether. On the other hand, the stream from the smallest watershed, which usually has the lowest discharge, still flows. All watersheds have received approximately the same amount of precipitation.

During the period August 20-23, we made a number of volumetic checks on our $120^{\circ}$ V-notch weirs to determine the applicability of the experimental discharge formula $Q = 4.43\ H^{2.449}$. Flows were low from all five watersheds. There was so little discharge from number four that no check could be made. The results of the checks are tabulated below:

| Watershed number | Check no. | Head determined by hook gage (feet) | Discharge determined by formula (c.f.s.) | Actual discharge (c.f.s.) | Actual discharge divided by formula discharge |
|---|---|---|---|---|---|
| 1 | 1 | .015 | .0001 | .0001 | 1.00 |
| | 2 | .015 | .0001 | .0001 | 1.00 |
| | 3 | .026 | .0006 | .0006 | 1.00 |
| | 4 | .027 | .0006 | .0006 | 1.00 |
| | 5 | .028 | .0007 | .0007 | 1.00 |
| 2 | 1 | .024 | .0005 | .0007 | 1.40 |
| | 2 | .025 | .0005 | .0007 | 1.40 |
| | 3 | .025 | .0005 | .0007 | 1.40 |
| | 4 | .025 | .0005 | .0007 | 1.40 |
| | 5 | .025 | .0005 | .0008 | 1.60 |
| 3 | 1 | .038 | .0015 | .0018 | 1.20 |
| | 2 | .039 | .0016 | .0019 | 1.19 |
| | 3 | .039 | .0016 | .0019 | 1.19 |
| | 4 | .039 | .0016 | .0020 | 1.25 |
| | 5 | .041 | .0018 | .0021 | 1.17 |
| 4 | Flow too low to check | | | | |
| 5 | 1 | .035 | .0012 | .0016 | 1.33 |
| | 2 | .036 | .0013 | .0017 | 1.31 |
| | 3 | .037 | .0014 | .0019 | 1.36 |
| | 4 | .037 | .0014 | .0017 | 1.21 |
| | 5 | .040 | .0017 | .0020 | 1.18 |

A levelling check determined that the reference bar correction factors for the hook gage readings were accurate. It appears that, for these very low flows at least, we need discharge valves for some of our watersheds other than those given by the formula. As soon as higher flows are available for checking, new rating curves will be drawn.

Soil loss from main skid roads.--Examination of the measurements taken of soil loss (or gain) from three logging roads indicates that sample profile measurements should be close together to give an accurate estimate of soil disturbance. Though this conclusion is based on limited data, the measurements indicate that to accurately determine soil loss during skidding requires more intensive sampling than the one chain intervals we used.

Agriculture--Forest Service--Upper Darby